CHAPTER 9. INSTRUMENT LANDING SYSTEM (ILS)

900. GENERAL. This chapter applies to approach procedures based on the Instrument Landing System (ILS).

901. DEFINITION OF TYPES.

a. ILS Category I. An ILS approach procedure which provides for approach to a decision height of not less than 200 feet.

b. ILS Category II. See Section 6. Criteria to be incorporated at a later date.

c. ILS Category III. See Section 7. Criteria to be incorporated at a later date.

d. Localizer and LDA. Approach procedures which do not use the glide slope component of the ILS.

e. Simultaneous ILS. An ILS approach procedure based on ILS installations which serve parallel runways and provides for simultaneous approaches to authorized minimums.

902.-909. RESERVED.

Section 1. ILS Category I Components

* **910. SYSTEM COMPONENTS.** The Category I ILS procedures are based upon the components listed below. Substitution is permitted only as specified in Paragraphs 283, 911, 912, and 930.

a. Localizer (LOC), Category I quality or better.

b. Glide Slope (GS), Category I quality or better.

c. Outer Marker (OM). *

* **911. COMPASS LOCATOR (LOM).** Compass locator radio facilities may be installed at outer marker sites, but are not considered basic components of the ILS. However, when installed, they may be used in lieu of the outer marker. *

912. DISTANCE MEASURING EQUIPMENT (DME). When installed with the ILS, DME may be used in lieu of the outer marker. When a unique operational requirement exists, DME information derived from a separate facility, as specified in Paragraph 282, may also be used to provide ARC initial approaches, a FAF for back course (BC) approaches, or as a substitute for the outer marker. When used as a substitute for the outer marker, the fix displacement error shall NOT exceed plus or minue 1/2 mile and the angular divergence of the signal sources shall NOT exceed 6 degrees.

913. INOPERATIVE COMPONENTS. A complete Category I ILS consists of the components specified in Paragraph 910. When the localizer fails, an ILS approach is not authorized. When the glide slope becomes inoperative or is not available, the ILS reverts to a nonprecision approach system. In this case, obstacle clearance from Paragraph 954 and the nonprecision minimums from Paragraph 350 apply. * When other components become inoperative, the ILS may continue in use with the landing minimums as prescribed in Paragraph 350. *

914.-919. RESERVED.

Section 2. ILS Category I Criteria

920. FEEDER ROUTES. The criteria for feeder routes are contained in Chapter 2, Section 2.

921. INITIAL APPROACH SEGMENT. The criteria for the initial approach segment are contained in Chapter 2, Section 3. Procedrue turns shall be specified from the outer marker wherever practical.

922. INTERMEDIATE SEGMENT. Except as stated in this paragraph, the criteria for the intermediate segment are contained in chapter 2, section 4. The intermediate segment begins at the point where the initial approach course intercepts the localizer course. It extends along the inbound localizer course to the FAF for localizer approaches or the glide slope intercept point for ILS approaches. The minimum length of the intermediate segment depends on the angle at which the initial approach course intersects the localizer course, and is specified in table 18. The MAXIMUM angle of intersection shall be 90 degrees, unless a lead radial, as specified in paragraph 232a, is provided and the length of the intermediate segment is increased in accordance with paragraph 242b. See figure 75.

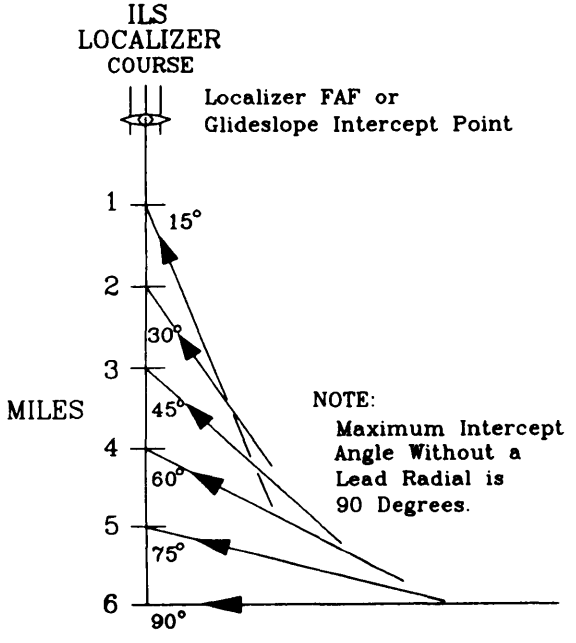


Figure 75. INTERMEDIATE SEGMENT vs. ANGLE OF INTERSECTION. ILS Category I. Par. 922.

923. DESCENT GRADIENT. Even though the minimum length of the intermediate segment may be less than that specified in chapter 2, section 4, intermediate descent criteria specified in paragraphs 242d and 243d shall be applied to at least 5 miles of flight track immediately prior to the glide slope intercept point.

Table 18. INTERSECTION ANGLE vs. LENGTH OF INTERMEDIATE SEGMENT.

Maximum Angle of Intersection (Degrees)	Minimum Length of Segment (Miles)
15	1
30	2
45	3
60	4
75	5
90–96	6

924. ALTITUDE SELECTION. Altitudes selected for the initial approach and intermediate approach segments shall be established and provide required obstacle clearance as specified in chapter 2. In addition, the selected altitudes shall be limited as follows:

a. Procedure Turn. The procedure turn completion altitude shall NOT be lower than the glide slope interception altitude nor more than 500 feet above the glide slope interception altitude. The glide slope interception point shall be the outer marker whenever possible.

b. High Altitude Teardrop Penetration Turn. The penetration turn completion altitude shall NOT be lower than the glide slope interception altitude nor more than 4000 feet above the glide slope interception altitude. The glide slope interception point shall be the outer marker whenever possible.

c. Other Initial Approaches. The altitude at which the localizer course is intercepted shall NOT be less than the glide slope interception altitude.

d. Intermediate Approach. The altitude shall NOT be less than the glide slope interception altitude. The glide slope interception point shall be the outer marker whenever possible. When the glide slope is inoperative, the intermediate approach altitude shall provide at least 500 feet of obstacle clearance from the point of interception of the localizer course to the outer marker or other final approach fix. The altitudes selected by application of the obstacle clearance specified in this paragraph may be rounded to the nearest 100 feet. See paragraph 231.

925.-929. RESERVED.

Section 3. ILS Category I Final Approach

930. FINAL APPROACH SEGMENT. The final approach segment shall begin at the point where the glide slope is intercepted, and descent to the authorized decision height (DH) begins. Where possible, this point *shall be coincidental with a designated FAF. (See paragraph 287 for satisfactory fix.) At locations where * it is not possible for the point of glide slope intercept to coincide with a designated FAF, the point of glide slope interception shall be located PRIOR to the FAF. Where a designated FAF cannot be provided, specific authorization by the approving authority is required.

a. Alignment. The final approach course is normally aligned with the runway centerline. Where a unique operational requirement indicates a need for an offset course, it may be approved, provided the course intersects the runway centerline at a point 1,100 to 1,200 feet toward the runway threshold from the DH point on the glide flope and the angular divergence of the course does NOT exceed 3 degrees.

b. Area. The area considered for obstacle clearance in the final approach segment consists of a final approach area and transitional surfaces.

(1) Final Approach Area. The final approach area has the following dimensions:

(a) Length. The final approach area is 50,000 feet long measured outward along the final approach course from a point beginning 200 feet outward from the runway threshold. Where operationally required by other procedural considerations due to existing obstacles, the length may be increased al shown in Figure 76. The final approach area used shall only be that portion of the area which is between the glide slope interception point and the point 200 feet from the threshold.

(b) Width. The final approach area is centered on the extended runway centerline except in those cases where an offset localizer is required, as provided in paragraph 930a, in which case the area is centered on the final approach course. The area has a width of 1,000 feet at the point 200 feet from the threshold and expands uniformly to a width of 16,000 feet at a point 50,000 feet from the point of beginning. This width further expands uniformly where greater length is required as in paragraph 930b(1)(a). See figure 76.

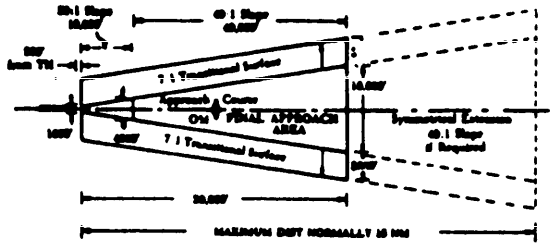


Figure 76. ILS CATEGORY I FINAL APPROACH AREA. Par 930

The width either side of the centerline at a given distance "D" from the point of beginning can be found by using the formula "500+.15D=1/2W"; e.g.; 500+.15x50,000=8,000, which is 1/2 width; therefore, the total width is 16,000 feet at the 50,000 foot point.

NOTE: *Where glide slope interception occurs at a distance greater than 50,200 feet from the threshold, the final approach area and the final approach surface may be extended symmetrically to a maximum distance dictated by the usability of the glide slope.*

931. FINAL APPROACH OBSTACLE CLEARANCE SURFACE. The final approach obstacle surface is an inclined plane which originates at the runway threshold elevation 975 feet outward from the GPI, and which overlies the final approach area. The surface is divided into two sections: an inner 10,000-foot section and an outer 40,000-foot section. The slope of the surface changes at the 10,000-foot point. The exact gradient may differ according to the angle at which the glide slope is established. The 50:1 and 40:1 slopes which are applicable to the 2 1/2-degree glide slope shall be established unless other slopes must be used to assure required clearance over existing obstacles. Table 19 specifies slopes which provide the minimum required obstacle clearance for several glide slope angles. See also paragraphs 934 and 935.

932. TRANSITIONAL SURFACES. Transitional surfaces for ILS Category I are inclined planes with a slope of 7:1 which extend outward and upward from the edge of the final approach area, starting at the height of

Table 19. ILS CATEGORY I GS ANGLE VS. SLOPES OF SURFACES.

GS Angle (Degrees)	Approximate Slope of Inner Section	Approximate Slope of Outer Section
2	96.5:1	61.5:1
2 1/4	66:1	48.5:1
2 1/2	50:1	40:1
2 3/4	40.5:1	34:1
3	34:1	29.5:1

NOTE: See graph, Appendix 2, Figure 132 for interpolation.

the applicable final approach surface and extending for a lateral distance of 5,000 feet at right angles to the final approach point. See figure 76.

933. DELETED.

934. OBSTACLE CLEARANCE OUTSIDE THE DH POINT. No obstacle shall penetrate the applicable final approach obstacle clearance surface specified in paragraph 931 or the transitional surfaces specified in paragraph 932. The required obstacle clearance is based on the difference between the glide slope angle and the appropriate final approach surface specified in paragraph 931. To determine the minimum required obstacle clearance in feet for any given distance "D" from the GPI, the following formulas may be used:

For "D" less than 10,975 feet, the minimum required clearance is .02366 D + 20 feet. See paragraph 935.

For "D" 10,975 feet or more, the minimum required clearance is .01866 D + 75 feet.

The clearance provided by these formulas is a minimum requirement. Greater clearance may be necessary in the interest of safety, due to such factors as precipitous terrain or ILS installation peculiarities. The Nomograph in Figure 77 provides a simple method for determining the minimum obstacle clearance requirements. Included in Figure 77 is also an example for determing the required glide slope angle. See also paragraph 935.

935. OBSTACLE CLEARANCE INSIDE THE DH POINT. The lowest landing minimums as specified in paragraph 350 may be approved when no obstacle penetrates the final approach obstacle clearance surface applicable to the commissioned glide slope angle, commencing 200 feet outward from the threshold and at least 975 feet from the GPI, and extending to the DH point. When penetration of this surface exists, consideration should be given to the removal of the obstacle or relocation of the landing threshold. See Figure 131. *

936. GLIDE SLOPE. In addition to the required obstacle clearance, the following shall apply to the selection of glide slope angle and antenna location:

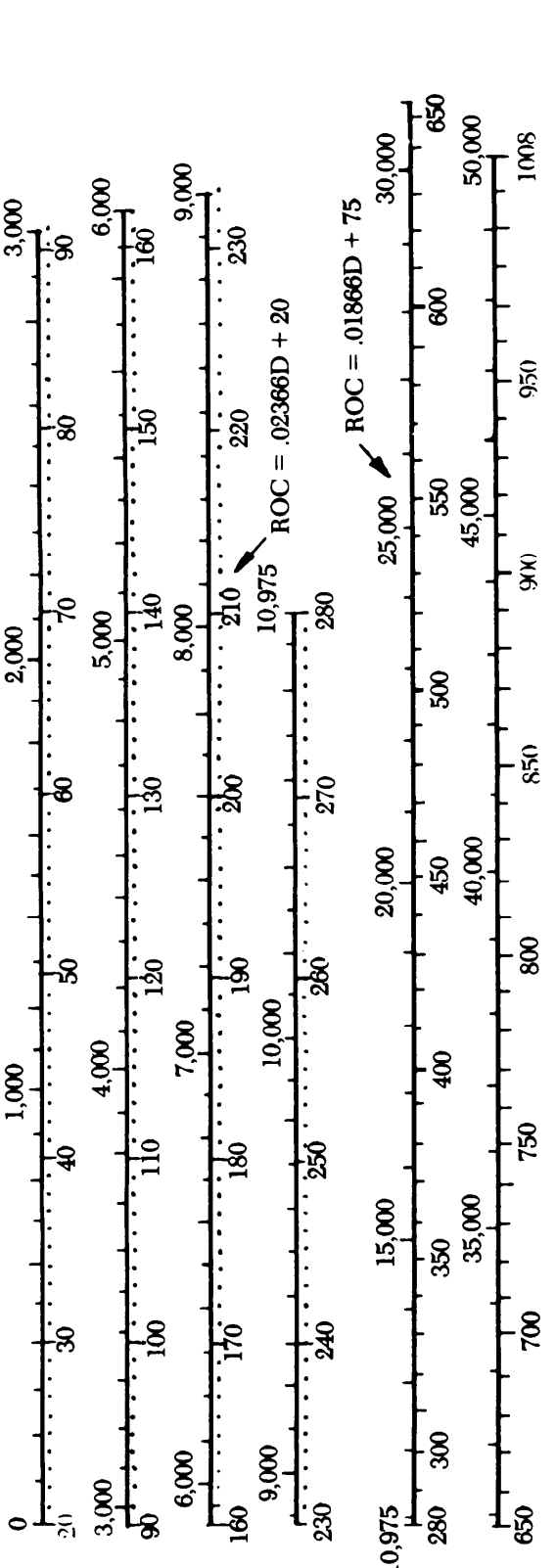
a. Glide Slope Angle.

(1) Civil ILS Facilities. All new and relocated ILS facilities will be commissioned with a 3° glide slope angle. Existing facilities may continue in operation without change in the established glide slope angle. Angles over 3° shall not be established without Office of Flight Operations, FAA, Washington, D.C., approval.

(2) Military ILS Facilities. The optimum glide slope angle is 2 1/2°. Angles less than 2° or more than 3° shall not be established without the authorization of the approving authority.

NOTE. *Where PAR serves a runway that is also served by ILS and/or VASI, the PAR, ILS, and VASI glide slope angles and RPI shall coincide. The PAR glide slope angle shall be within 0.20 of the ILS/VASI glide slope angle and the RPI shall be within plus or minue 50 feet of the ILS/RPI and/or VASI runway reference point (RRP).*

b. Glide Slope Threshold Crossing Height. The OPTIMUM threshold crossing height is 50 feet. The MAXIMUM is 60 feet. A height as low as 32 feet for military airports may be used at locations where special consideration of the glide path angle and antenna location are required. Where the glide slope threshold crossing height exceeds 60 feet, consideration shall be given to the relocation of the landing threshold to insure effective placement of the approach light system. See Appendix 2 for a method of computing threshold crossing height.



The lowest glide slope that will provide the required obstacle clearance (ROC) over a critical obstacle is found by the formula:

$$\text{Tan of GS angle} = \frac{\text{Obstacle height + ROC}}{\text{GPI to obstacle Distance}}$$

$$\text{Tan of GS angle} = \frac{238 + 233}{9000} = \frac{471}{9,000} = 0.0523$$

Arc Tan 0.0523 = 3.0 degrees

EXAMPLE:

Controlling obstacle is 238 feet above runway elevation and 9000 feet from the GPI. Find the minimum GS angle

From the nomograph find 233 feet opposite 9000 feet, or use the formula (0.02366 × 9000) + 20 = 233

NOTE: A method with an example of criteria application (Paragraphs 931 through 935) is included in Appendix 2.

Figure 77. ILS CATEGORY I FINAL APPROACH AREA OBSTACLE CLEARANCE. Par 934.
(This nomograph should not be used to determine ROC inside the DH or MAP. The ROC inside the DH/MAP must be computed in accordance with Appendix 2, Par 11b (1).)

c. Antenna Mast Height. The antenna mast or monitor should be located at a MINIMUM distance of 400 feet from the runway centerline and should not exceed 55 feet in height above the elevation of the runway centerline nearest it. A mast of over 55 feet may be permitted if the minimum distance from the runway centerline is increased by 10 feet for each foot the mast exceeds 55 feet. When a mast cannot for technical or economic reasons be located at a minimum distance of 400 feet from the runway centerline, the minimum distance may be reduced to not less than 250 feet from the centerline provided the basic mast height of 55 feet is reduced by .2D; where D is the distance inward from the 400 foot point. See Figure 78.

937. RELOCATION OF GLIDE SLOPE. Where minimum obstacle clearance cannot be obtained with a 3 degree glide slope angle, and sufficient length of runway is available, the glide slope may be moved the required distance down the runway to obtain the minimum obstacle clearance in the final approach area. Where the glide slope threshold crossing height exceeds 60 feet, consideration should be given to relocating the landing threshold to insure effective placement of the approach light system. The minimum distance between the GPI and the runway threshold is 775 feet. (No minimum GPI distance need be applied to military locations provided minimum ROC and TCH standards are met.)

938. DECISION HEIGHT (DH).

a. Minimum Decision Height. For ILS Category I the decision height shall be no lower than 200 feet above the touchdown zone (TDZ) elevation.

b. Adjustment of Decision Height.

(1) Primary Final Approach Surface. When minimum obstacle clearance cannot be obtained with a 3 degree glide slope angle, and the approving authority will not approve an angle in excess of 3 degrees, and the runway length does not permit a compensating adjustment, the decision height shall be increased accordingly. To establish the minimum decision height which can be authorized, extend a line horizontally outward from the top of each penetrating obstacle, parallel with the runway centerline, to a point of interception with the established final approach obstacle clearance surface. From the controlling point, extend a line vertically to a point of intersection with the glide slope. The height at the point of intersection with the glide slope is the minimum decision height, except that application of this method need not require a decision height that is more than 250 feet above the obstacle. This decision height shall not be less than 250 feet. See Figure 79.

(2) Transitional Surface. Where minimum obstacle clearances cannot be met in the tran-

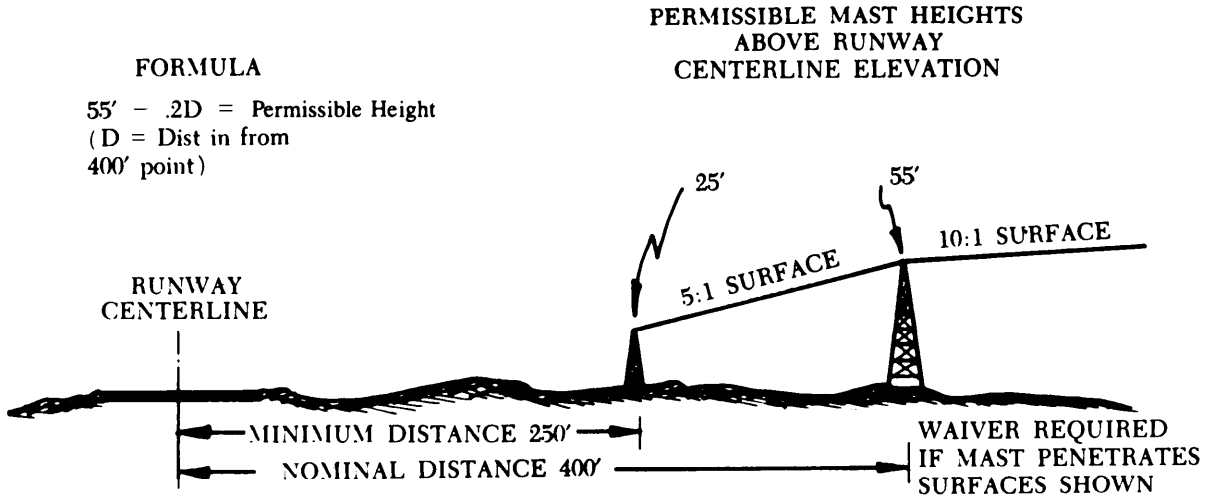


Figure 78. GLIDE SLOPE ANTENNA LOCATION VS. HEIGHT. Par 936.c.

sitional surfaces, and when deemed necessary, consideration will be given to an adjustment in the decision height commensurate with the degree of interference presented by the particular obstacle or obstacles. See Figure 79.

939. RESERVED.

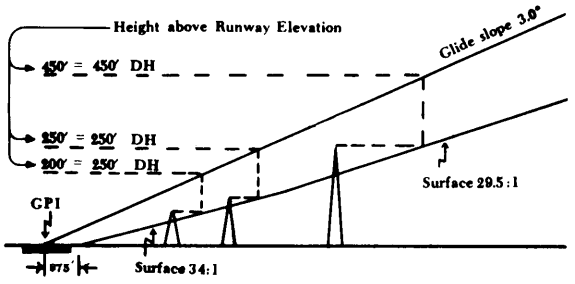


Figure 79. ADJUSTMENT OF DECISION HEIGHT. Par 938.

Section 4. ILS Category I Missed Approach

940. MISSED APPROACH SEGMENT. The missed approach segment begins at the missed approach point and ends at an appropriate point or fix where initial approach or enroute obstacle clearance is provided. Missed approach procedures shall be based on positive course guidance where possible.

941. MISSED APPROACH POINT (MAP). The missed approach point is a point on the final approach course where the height of the glide slope equals the authorized decision height.

942. STRAIGHT MISSED APPROACH. The straight missed approach area (maximum of 15 degree turn from final approach course) starts at the missed approach point. The length of the area is 15 miles, measured along the missed approach course. The area has a width equal to that of the final approach area at the missed approach point and a width equal to that of the initial approach area at a point 15 miles from the MAP. The missed approach area is divided into 2 sections.

a. Section 1 starts at the MAP and is longitudinally centered on the missed approach course. It has the same width at the MAP as the final approach area. The total width increases to 1 mile at a point 1.5 miles from the MAP.

b. Section 2 starts at the end of Section 1 and is centered on a continuation of the Section 1 course. The width increases uniformly from 1 mile at the beginning to 12 miles at a point 13.5 miles from the beginning. A secondary area for reduction of obstacle clearance is identified within Section 2. The secondary area is zero miles wide at the beginning and increases uniformly to 2 miles wide at the end of Section 2. Positive course guidance is required to reduce obstacle clearance in the secondary areas. See Figure 80.

943. TURNING MISSED APPROACH. Where turns of less than 15 degrees are required in a missed approach procedure, the provisions of Paragraph 942.a. and b. apply. Where turns of MORE than 15 degrees are required, they shall be specified to commence at an altitude which is at least 400 feet above the elevation of the touchdown zone. Altitudes required prior to commencing a turn shall be specified in the published procedure. Such turns are assumed to commence at the point where Section 2 begins. The flight track and obstacle clearance radii used shall be as specified in Table 5, Paragraph 275. The inner boundary line shall commence at the edge of Section 1 opposite the MAP. The outer and inner boundary lines shall flare to the width of the initial approach area 13.5 miles from the beginning of Section 2. Secondary areas for reduction of obstacle clearance are identified within Section 2. The secondary areas begin after completion of the turn. They are zero miles wide at the beginning and increase uniformly to 2 miles wide at the end of Section 2. Positive course guidance is required to

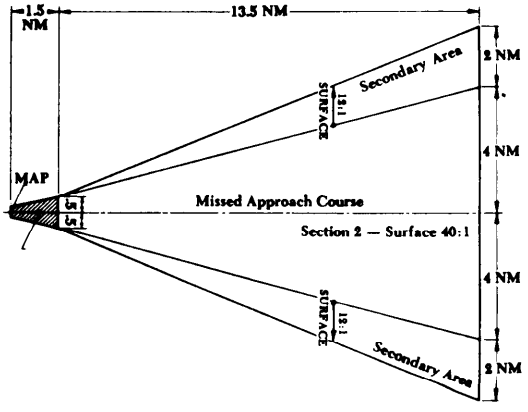


Figure 80. ILS STRAIGHT MISSED APPROACH AREA. Par 942.

reduce obstacle clearance in the secondary area. See Figure 81.

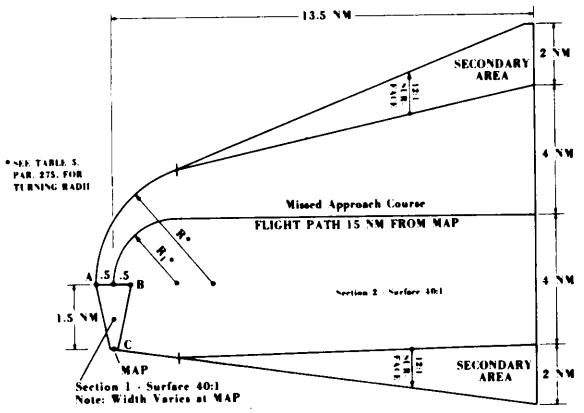


Figure 81. ILS TURNING MISSED APPROACH AREA.
Par 943.

944. MISSED APPROACH OBSTACLE CLEARANCE.

a. Straight Missed Approach Area. No obstacle in Section 1 or Section 2 may penetrate a 40:1 surface which originates at the MAP at the height of the final approach obstacle clearance surface, but not more than 250 feet below the DH, and which overlies the entire missed approach area.

b. Turning Missed Approach Area. Section 1 obstacle clearance is the same as that for straight missed approaches. To determine the obstacle clearance requirements in Section 2, the dividing line between Section 1 and 2 is identified as "A-B-C". The height of the missed approach surface over any obstacle in Section 2 is determined by measuring the distance from the obstacle to the nearest point on line A-B-C and computing the height according to the 40:1 ratio, starting at the height of the missed approach surface at the end of Section 1.

c. Secondary Areas. Where secondary areas are considered, no obstacle may penetrate a 12:1 surface which slopes outward and upward from the missed approach surface.

d. Discontinuance. Where the 40:1 surface reaches a height of 1000 feet below the missed approach altitude (Paragraph 270) further application of the surface is not required.

945. COMBINATION STRAIGHT AND TURNING MISSED APPROACH AREA. If a straight climb to an altitude greater than 400 feet is necessary prior to commencing a missed approach turn, a combination straight and turning missed approach area must be constructed. The straight portion of this missed approach area is divided into Sections 1 and 1A. The portion in which the turn is made is Section 2.

a. Straight Portion. Sections 1 and 1A correspond respectively to Sections 1 and 2 of the normal straight missed approach area and are constructed as specified in Paragraph 942 except that Section 1A has no secondary areas. Obstacle clearance is provided as specified in Paragraph 944.b. The length of Section 1A is determined as shown in Figure 82 and relates to the need to climb to a specified altitude prior to commencing the turn. The line A'-B' marks the end of Section 1A. Point C' is 9000 feet from the end of Section 1A. (See Figure 82.)

b. Turning Portion. Section 2 is constructed as specified in Paragraph 943 except that it begins at the end of Section 1A instead of the end of Section 1. To determine the height which must be attained before commencing the missed approach turn, first identify the controlling obstacle on the side of Section 1A to which the turn is to be made. Then measure the distance from this obstacle to the nearest edge of the Section 1A area. Using this distance as illustrated in Figure 82, determine the height of the 40:1 slope at the edge of Section 1A. This height plus 250 feet (rounded off to the next higher 20 foot increment) is the height at which the turn should be started. Obstacle clearance requirements in Section 2 are the same as those specified in Paragraph 944.b. except that Section 2 is expanded to start at Point C if no fix exists at the end of Section 1A or if no course guidance is provided in Section 2 (See Figure 82.)

946.-949. RESERVED.

Section 5. Localizer and LDA

950. FEEDER ROUTES, INITIAL APPROACH, AND INTERMEDIATE SEGMENTS. These criteria are contained in Paragraphs 920, 921, 922, and 923.

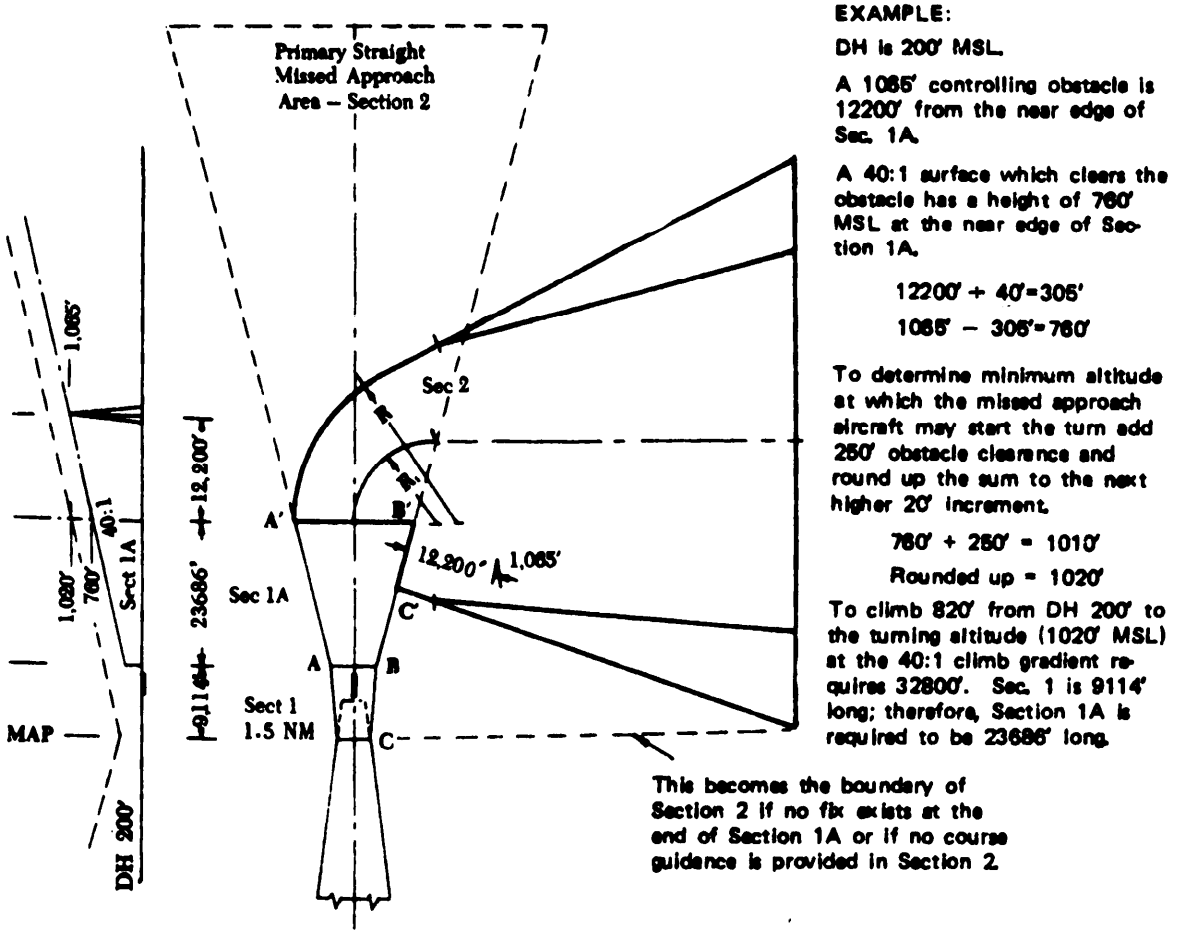


Figure 82. COMBINATION STRAIGHT AND TURNING MISSED APPROACH AREA. Par 945.

951. USE OF LOCALIZER ONLY. Where no usable glide slope is available, a localizer-only (front or back course) approach may be approved, provided the approach is made on a localizer from a final approach fix located within 10 miles of the runway threshold. Criteria in this section are also applicable to procedures based on localizer type directional aids (LDA). Back course procedures shall not be based on courses which exceed 6 degrees in width and shall not be approved for offset localizers.

952. ALIGNMENT. Localizers which are aligned within 3 degrees of the runway alignment shall be identified as localizers. If the alignment exceeds 3 degrees, they will be identified as LDA facilities. The alignment of the course for LDA facilities shall meet the final approach alignment criteria for VOR on-airport facilities. See Chapter 5, Paragraph 513, and Figure 48.

953. AREA. The final approach area and transitional surface dimensions are as specified in Paragraph 930. However, only that portion of the final approach area which is between the FAF and the runway need be considered as the final approach segment for obstacle clearance purposes. The optimum length of the final approach segment is 5 miles. The MINIMUM length of the final approach segment shall be sufficient to provide adequate distance for an aircraft to make the required descent. The area shall be centered on the final approach course and shall commence at the runway threshold. For

LDA procedures the final approach area shall commence at the facility and extend to the FAF. The MAP for LDA procedures shall not be farther from the FAF than a point adjacent to the landing threshold perpendicular to the final approach course.

954. OBSTACLE CLEARANCE. The minimum obstacle clearance in the final approach area shall be 250 feet. In addition, the MDA established for the final approach area shall assure that no obstacles penetrate the transitional surfaces. The transitional surfaces in localizer-only type approaches begin at a height not less than 250 feet below the MDA.

955. DESCENT GRADIENT. The OPTIMUM descent gradient for a localizer-only approach should not exceed 300 feet per mile. The MAXIMUM descent gradient and method of computation shall be as specified in paragraph 513d.

956. MINIMUM DESCENT ALTITUDE. Because no glideslope is associated with a localizer-only approach, the lowest altitude on final approach is specified as an MDA, not a decision height (DH). The MDA adjustments specified in paragraph 232 shall be considered.

957. MISSED APPROACH SEGMENT. The criteria for the missed approach segment are contained in paragraphs 942, 943, and 945. The missed approach point is on the final approach course not farther from the final approach fix than the runway threshold (first usable portion of the landing area for circling approach). The missed approach surface shall commence over the MAP at the required height. See paragraph 274.

958.-959. RESERVED.

Section 6. ILS Category II

960.-969. RESERVED.

Section 7. ILS Category III

970.-979. RESERVED.

Section 8. RESERVED.

980.-989. RESERVED.

* Section 9. Simultaneous ILS Procedures

990. GENERAL. Simultaneous dual and triple ILS approach procedures using ILS installations with parallel courses may be authorized when the minimum standards in this section and section 1 are met. *

991. SYSTEM COMPONENTS. Simultaneous ILS approach procedures require the following basic components.

a. An ILS specified in section 1 of this chapter for each runway. Adjacent markers of the separate systems shall be separated sufficiently to preclude interference at altitudes intended for use.

* b. ATC approved radar for monitoring simultaneous operations.

992. INOPERATIVE COMPONENTS. When any component specified in paragraph 991 becomes inoperative, simultaneous ILS approaches are not authorized on that runway. *

993. FEEDER ROUTES. The criteria for feeder routes are contained in chapter 2, section 2.

994. INITIAL APPROACH SEGMENT. The criteria for the initial approach segment are contained in chapter 2, section 3. The initial approach shall be made from a facility or satisfactory radio fix by radar vector. Procedure and penetration turns shall not be authorized.

* a. **Altitude Selection.** In addition to obstacle clearance requirements, the altitudes established for initial approach shall provide the following vertical separation between glide slope intercept altitudes.

(1) **Dual.** Simultaneous dual ILS approaches shall require at least 1,000 feet vertical separation between glide slope intercept altitudes for the two systems. See figure 96A.

(2) **Triple.** Simultaneous triple ILS approaches shall require at least 1,000 feet vertical separation between glide slope intercept altitudes for any combination of runways. No two runways share the same glide slope intercept altitude. See figure 96B.

b. **Localizer Intercept Point.** The localizer intercept point shall be established in accordance with paragraph 922. Intercept angles may not exceed 30 degrees; 20 degrees is optimum. *

995. INTERMEDIATE APPROACH SEGMENT. Criteria for the intermediate segment are contained in paragraphs 241 and 242, except that simultaneous ILS procedures shall be constructed with a straight intermediate segment aligned with the final approach course, and the minimum length shall be established in accordance with paragraph 922. The intermediate segment begins at the point where the initial approach intercepts the final approach course. It extends along the inbound course to the glideslope intercept point.

996. FINAL APPROACH SEGMENT. Criteria for the final approach segment are contained in section 3 of this chapter.

997. FINAL APPROACH COURSE STANDARDS. The final approach courses for simultaneous ILS approaches require the following:

a. Dual approaches shall have a minimum of 4,300 feet separation between parallel final approach courses.

b. Triple approaches shall have a minimum of 5,000 feet separation between parallel final approach courses. For triple parallel approach operations at airport elevations above 1000 feet MSL, airport surveillance radar with high resolution final monitor aids or high update radar with associated final monitor aids shall be required.

c. No Transgression Zone (NTZ). The NTZ shall be 2,000 feet wide equidistant between final approach courses.

d. Normal Operating Zone (NOZ). The area between the final approach course and the NTZ is half of the normal operating zone.

(1) The NOZ for dual simultaneous ILS approaches shall not be less than 1,150 feet in width each side of the final approach course. See figure 97A.

(2) The NOZ for triple simultaneous ILS approaches shall not be less than 1,500 feet in width each side of the final approach course. See figure 97B.

998. MISSED APPROACH SEGMENT. Except as stated in this paragraph, the criteria for missed approach are contained in section 4 of this chapter. A missed approach shall be established for each of the simultaneous systems. The minimum altitude specified for commencing a turn on a climb straight ahead for a missed approach shall not be less than 400 feet above the TDZE.

a. Dual. Missed approach courses shall diverge a minimum of 45 degrees.

b. Triple. The missed approach for the center runway should continue straight ahead. A minimum of 45-degree divergence shall be provided between adjacent missed approach headings. At least one outside parallel shall have a turn height specified that is not greater than 500 feet above the TDZ elevation for that runway.

999. RESERVED.

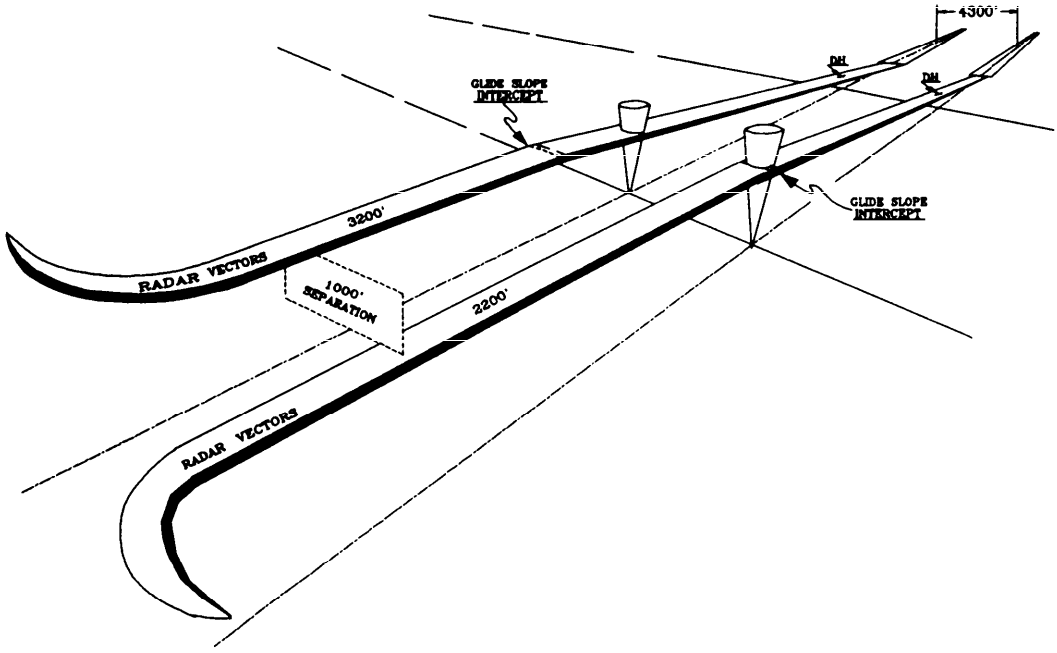


Figure 96A. INITIAL APPROACH SEGMENT, SIMULTANEOUS ILS. Par 994.

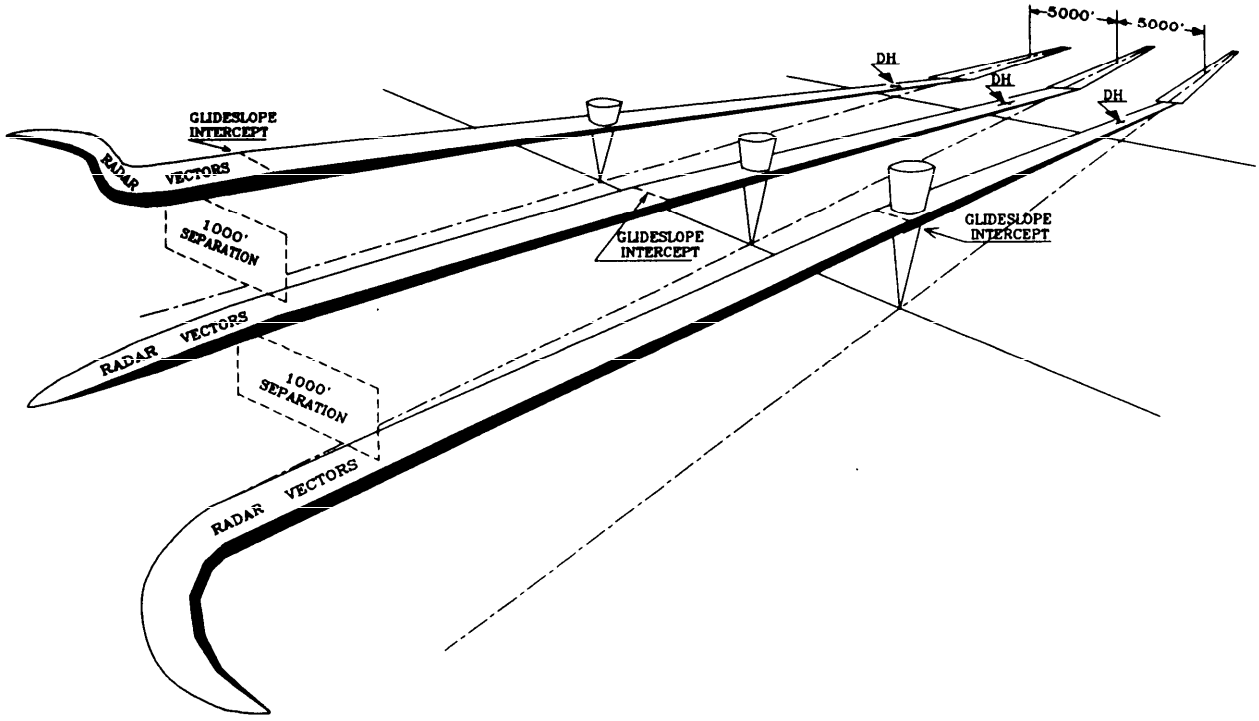


Figure 96B. INITIAL APPROACH SEGMENT FOR TRIPLE SIMULTANEOUS ILS. Par 994.

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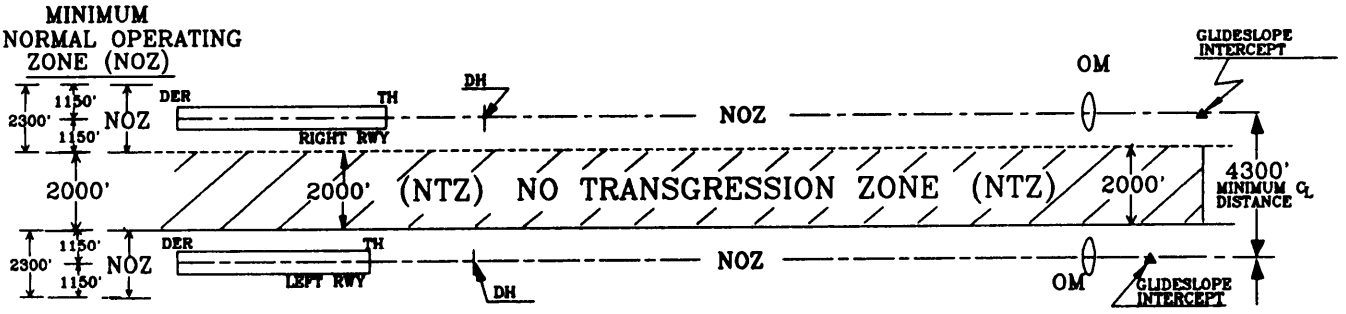

Figure 97A. DUAL SIMULTANEOUS ILS "NO TRANSGRESSION AND NORMAL OPERATING ZONES." Par 997.

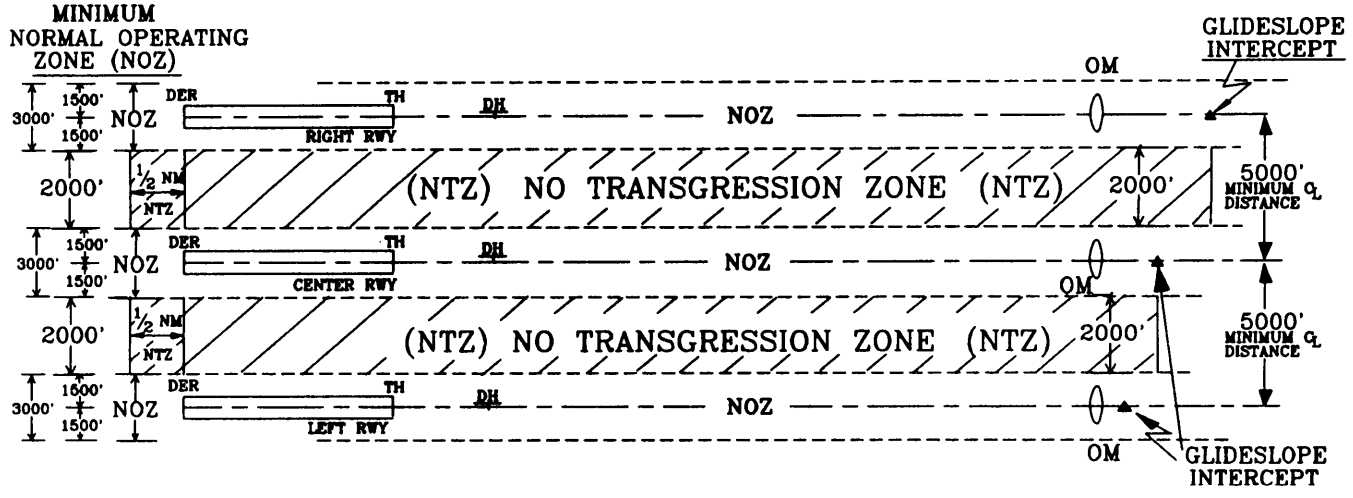

Figure 97B. TRIPLE SIMULTANEOUS ILS "NO TRANSGRESSION AND NORMAL OPERATING ZONES." Par 997.

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